INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

24 September 2014 (pm)

Subject ST9 – Enterprise Risk Management

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*
2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*
3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*
4. *Mark allocations are shown in brackets.*
5. *Attempt all six questions, beginning your answer to each question on a new page.*
6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 Northern Insurance has separate Risk and Actuarial functions. Southern Insurance has a combined Risk and Actuarial team.

Discuss the relative merits of the two approaches. [5]

2 A general insurance company is investigating the correlation of claims arising between two insurance classes: Type A and Type B.

Past total claims experience (in $000) has been as follows:

	Type A	*Type B*
2009	164	769
2010	149	463
2011	125	426
2012	211	685
2013	203	500
Overall Total	**852**	**2,843**
Mean	170.4	568.6

(i) Calculate Pearson's rho for these two sets of data. [4]

(ii) Calculate Kendall's tau for these two sets of data. [3]

(iii) Outline the relative merits of these two correlation measures. [2]

(iv) Suggest, with reasons, possible insurance classes that are represented by Type A and Type B. [2]

[Total 11]

3 ABC Life is a small life insurance company. It is currently developing a disaster recovery plan for its operations.

(i) Define operational risk. [1]

(ii) Outline how ABC Life could measure its operational risk exposure. [5]

As part of its operational risk monitoring, the risk management team is carrying out interviews with each of the senior managers in order to categorise the criticality of all the company's processes.

(iii) Outline the advantages and disadvantages of the chosen interview approach. [4]

(iv) Explain the need for a disaster recovery plan for ABC Life. [2]

ABC Life is proposing including disaster risk in the operational risk component of its economic capital model.

(v) Comment on this proposal. [4]

ABC Life is also developing its risk appetite statement.

(vi) Explain what is meant by a risk appetite, including examples of common ways in which it is expressed. [3]

ABC Life considers a definition based on profit to be the most appropriate. However it currently reports profit on three different bases, namely:

- The surplus emerging in its regulatory solvency accounts, which are prepared on a prudent basis.
- The profit before tax in its financial accounts.
- The economic profit arising (or "economic value added") based on its economic capital calculations.

(vii) Discuss which of these definitions would be most appropriate for the risk appetite statement. [5]

(viii) Outline the potential disadvantages to ABC Life of basing its risk appetite statement primarily on profit. [2]

[Total 26]

4 A leading accountancy professional body, APB, has decided to introduce its own ERM professional qualification. It has established the ERM Institute, ERMI, and accredited members will become fellows of the institute or FERMIs.

ERMI is a not for profit organisation (i.e. it has no shareholders and does not aim to make or distribute profits). The APB will lend funds to ERMI to establish itself and these funds will need to be repaid in due course.

ERMI will set essay style examinations with some straightforward calculations, coursework and a continuing professional development program. It intends to operate internationally in the future.

(i) Outline the risks facing ERMI. [6]

(ii) Suggest ways in which ERMI might mitigate or transfer these risks. [5]

ERMI has now been examining and awarding professional qualifications for two years. In its first year of operations 50% of candidates passed their examinations and in the second year of operations only 25% of candidates passed. The executive board is concerned that examination standards have changed to the detriment of the long run success of ERMI.

The examination process involves setting the examinations, marking the examinations and determining an appropriate pass mark.

(iii) Describe an examination process designed to minimise the risk that the standard required of candidates could vary from one examination to the next. [5]

[Total 16]

5 Predictable Life is a large life insurance company. It has developed a sophisticated generalised linear model (GLM) to assess mortality risk across a range of biometric, medical and socio-economic factors in order to set premium rates accordingly.

The sophistication of the model is a key source of Predictable Life's competitive advantage. The insurer collects both qualitative and quantitative data to support its model through a rigorous underwriting process.

(i) List the four main components of mortality risk that Predictable Life's model will assess. [2]

(ii) Outline the process of GLM modelling as it applies to mortality risk. [4]

(iii) Explain why Predictable Life may charge a different premium from that suggested by its model. [2]

Penny Saved Bank is a retail bank providing a diversified wealth management service to its clients. It does this by combining banking products with other financial services products provided by subsidiaries that it owns.

The bank's strategy is to maximise customer relationships and to earn a minimum profit per customer. As part of this strategy, it may from time to time use one product as a "loss leader". For example, it may use heavily discounted life insurance policies to secure sales of home loans.

(iv) Give a possible risk management rationale for this strategy. [2]

(v) Suggest key indicators that the bank could use in its internal management information to monitor the implementation of its strategy. [2]

(vi) Contrast the likely life insurance risk exposures of Predictable Life and Penny Saved Bank. [2]

Extreme Life is a niche EU life insurance company providing short term life insurance cover of fixed amounts to extreme sports enthusiasts. The policies are typically sold by travel agents. The cover excludes pre-existing conditions, but there are no other exclusions or underwriting criteria.

Extreme Life is the only insurer operating in this market. To date its pricing approach has been straightforward: it sets premiums for new policies based on the two year average claim cost plus a margin for expenses and profit.

(vii) Contrast the life insurance risk exposures of Predictable Life and Extreme Life. [3]

(viii) Explain whether Extreme Life should adopt an internal model under Solvency II. [2]

[Total 19]

6 The Association of Independent Lawyers (AIL) is a trade association offering a range of services to its independent member firms.

The supervisory professional body requires that every law firm maintains professional liability insurance (PLI). An entrepreneur has decided to establish a new insurance company, New Insurance Company (NIC), to write PLI. Initially it proposes to offer insurance solely to AIL member firms. It proposes to attract their business by ignoring their past claims experience when underwriting and by offering insurance at a substantial discount to current market rates.

The following information is provided:

AIL Membership Information

- 300 member firms with three or fewer lawyers each.
- 30 member firms with 50 lawyers each.

PLI Policy Terms Information

- No individual or aggregate claim limits per policy.
- No per claim deductible or excess.

PLI Premium Information

- Market premium in each of the past three years was £2,000 per lawyer including a £200 expense loading.
- Current market premium is £4,000 per lawyer including a £200 expense loading.

PLI Claims Information

- 99.5% of claims cost £20,000 on average and 0.5% of claims cost £1m on average.
- On average, a group of 100 lawyers is expected to incur 12 claims in any given year.

Aggregate Claims Cost Distribution Information

- The standard deviation of the distribution is assumed to be 30% of the mean.
- The 99.5th percentile of the distribution is assumed to be 3.5 standard deviations away from the mean.

Market Risk Information

- The portfolio of investments is expected to earn 4% per annum.
- The standard deviation of the distribution of total investment returns is assumed to be 25% of the mean.
- The 0.5th percentile of the distribution of total investment returns is assumed to be 2.2 standard deviations away from the mean.

Credit Risk Information

- The portfolio of investments is expected to incur credit default losses of 0.5% per annum.
- The standard deviation of the distribution of total credit default losses is assumed to be 50% of the mean.
- The 99.5th percentile of the distribution of credit default losses is assumed to be 2.6 standard deviations away from the mean.

Operational Risk Information

- Two operational risks have been identified. They each may happen once over the lifetime of the company.
- Risk A has an estimated cost of £500,000 and a probability of 5% of occurring in any year.
- Risk B has an estimated cost of £1,000,000 and a probability of 0.25% of occurring in any year.

You should assume that:

- 30% of member firms purchase PLI insurance from NIC.
- market risk and credit risk are 100% correlated.
- claims cost, operational risk and combined market/credit risk are independent of each other.

The financial services regulator requires that insurance companies hold regulatory capital in excess of best estimate reserves. The capital is estimated to enable the company to meet all of its liabilities in at least 99.5% of forecast future scenarios, assuming that the company writes business for one year only. The capital requirement is therefore calculated as the amount that would need to be held at outset in order to cover the overall reduction in the year end assets (net of any outstanding claims liabilities) under the 99.5% scenario relative to expected.

(i) Calculate the initial minimum regulatory capital requirements for NIC, stating your reasons for making the various calculations and any assumptions made. [16]

(ii) Suggest reasons why the regulator might require NIC to hold more than this minimum amount. [4]

The current market premium is relatively high due to very poor claims experience in the past three years.

(iii) Describe the additional investigations that should be conducted and the likely main implication for the calculation in part (i). [3]

[Total 23]

END OF PAPER